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TRENDS IN FRESHMAN ENGINEERING ENROLLMENT

1958 - 1959 - 1960

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education

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ENGINEERING MANPOWER COMMISSION
OF
ENGINEERS JOINT COUNCIL

29 West 39 Street
New York 18, N. Y.

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TRENDS IN FRESHMAN ENGINEERING ENROLLMENT

1958 - 1959 - 1960

A study of trends in engineering freshman enrollments and an evaluation of these trends by the Deans of Engineering.

Published

April, 1960

by Engineering Manpower Commission
of
Engineers Joint Council
29 West 39 Street
New York

Trends in Freshman Engineering Enrollment

Engineering freshman enrollment in the United States increased each year over the preceding year during the period 1950-1957. In 1958 this trend was reserved, and the freshman class was 11.1% smaller than that of the previous year. Another decline occured in 1959 when 67,704 enrolled as engineering freshman, representing a decline of 3.4% over 1958. The number of freshman in ECPD colleges declined by obout 1.7%.

Total college first-time enrollment increased during this same period. In 1958 the increase was 7.0% for all students and 5.0% for males only. In 1959 some 827,000 enrolled in college for the first time - up 5.9%; male enrollment was up 6.8%.

Freshman Enrollment in Engineering (1950-1959)

Year Fall of -	Number in all Institutions	Percentage change from previous year	Number in ECPD Accredited* Schools
1950	34,299	-18.1%	29,394
1951	39,571	+15.4	34,147
1952	51,631	+30.5	45,854
1953	60,478	+17.1	52,482
1954	65,505	+ 8.3	55,531
1955	72,825	+11.2	61,141
1956	77,738	+ 6.7	66,409
1957	78,757	+ 1.3	67,071
1958	70,029	-11.1	59,164
1959	67,704	- 3.4	58,155

*Institutions with one or more curricula accredited by the Engineers' Council for Professional Development. Enrollment Data Source: Annual Engineering Enrollments and Degrees Survey conducted by the Office of Education in cooperation with the American Society for Engineering Education.

Total engineering enrollment in 1959 was 278,348 (a decline of 3.9%) and 240,063 in ECPD colleges (similar drop). Undergraduate enrollment in all institutions was 242,992 and 205,332 for ECPD colleges (down 5.7%).

Enrollment Trend Study

In January 1959 the Engineering Manpower Commission, in cooperation with the American Society for Engineering Education, conducted a study among the Deans of Engineering to secure their views on the implications of the engineering enrollment decline and to identify the factors causing the decline. The results were published in April under the title "Trends in Freshman Engineering Enrollment, 1957-1958-1959."

In view of the continued decline in freshman engineering enrollment, the Engineering Manpower Commission decided to conduct a similar study in January 1960, to compare with the previous study and to determine if different factors have emerged that deserve consideration.

This report presents the results of the second study, based on information provided by over 160 Deans. Of the total replies, 151 provided sufficiently complete information for statistical tabulation. Some colleges do not identify engineering condidates at the freshman level and could not provide information on 1st year enrollment trends.

In 1959 there were 231 institutions in the U. S. that offered degree credit engineering courses. Only 154 had at least one curriculum accredited by the Engineers Council for Professional Development; of these, six do not report engineering freshman. Of the remaining 148 colleges 121 supplied data for the study.

The questionnaire was similar to the one used last year (see appendix), designed in a simple format to facilitate completion by the participants.

The replies were classified for analyses by the following categories:

Size - Group A - Those with 1959 freshman engineering enrollment of 1-to-499.

Group B - Those with 1959 freshman engineering enrollment of 500-or-more.

Support - A - Public
B.- Private

Geographic Location - EAST: Conn., Mass., Me., N.H., N.J., N. Y., Penna., R.I., Vt.

SOUTH: Ala., De., D.C., Fla., Ga., Ky., Miss., Md., N.C., S.C., Tenn., Va., W.Va., Puerto Rico

SOUTHCENTRAL: Ark., La., Okla., Tex.

MIDWEST: Ia., Ill., Ind., Ks., Mich., Minn., Mo., Nebr., N.Dak., Ohio, S. Dak., Wisc.

MOUNTAIN: Ariz., Colo., Idaho, Mont., Nev., N.Mex., Utah, Wyo.

PACIFIC: Calif., Ore., Wash., Alaska, Hawaii

Characteristics of Responding Institutions

By Size ----	1-499	500 & Above
1. Number of replies	119	31
2. Distribution-1959 Freshman	50%	50%
3. Freshman change - (1958-1959)	5.0%	3.4%

By Institutional Support ---	Public	Private
1. Number of replies	80	70
2. Distribution - 1959 Freshman	67%	33%
3. Freshman change - (1958-1959)	-4.8%	-3.4%

By Geographic Distribution ---	E	MW	S	SC	MT	P
1. Number of replies	44	35	29	15	11	16
2. Distribution - 1959 Freshman	25%	30%	17%	10%	7%	9%
3. Freshman change (1958-1959)	+0.5%	-3%	-5%	-12%	-7%	-6%

- -

These distributions indicate that: as a group the larger colleges had lesser declines in freshman enrollment than the smaller institutions; the enrollment drop was fairly evenly distributed between public and private colleges; eastern colleges - as a group - increased enrollment slightly while the southcentral schools suffer the severest declines.

Summary Results and Conclusions

For the second year in succession freshman engineering enrollment declined in the United States, at time when indications point to increased need for engineers in the future. The declines in engineering freshman was 11.1% in 1958 and 3.4% in 1959, while total college first-time enrollment continue to rise.

The Deans of Engineering of 150 colleges out of the 231 offering degree credit engineering courses in the United States expressed their views on the enrollment problem in a survey completed by the Engineering Manpower Commission of Engineers Joint Council.

The Deans reported the following factors:

I. Over half of all institutions received less applications from qualified student condidates in 1959 compared with 1958, also two thirds received in 1958 a smaller number of applications than in 1957. The drop in 1959 was attributed to:

1. Increased interest by qualified students in other fields of science.
2. Concern over the rigors and demands of engineering education.
3. Decrease in applications from students lacking in genuine interest and motivation for engineering.

II. About one half of all colleges accepted in 1959 a lower number of freshman for enrollment than in 1958.

A Higher proportion of candidates accepted for enrollment in 1959 actually enrolled, compared with the experience in 1958. The noticeable improvement in the "no show" problem undoubtedly helped to limit the decline in freshman enrollment.

A significant majority 83% of colleges anticipate maintaining the same level of freshman enrollment or increasing it in the Fall of 1960. The weight of evidence indicates that the freshman class this year will be larger than the 1959 class.

An increasing number of colleges report greater rates of attrition of engineering students in the undergraduate classes, compared with past years. Both in 1958 and 1959, 35% of the institutions indicated higher rate of student mortality. The reasons in the estimate of the Deans were: (1) Concern about the rigor of the engineering curriculum. (2) Application of higher scholastic standards and (3) Increased interest in other fields of science.

The public institutions and colleges in the South, Southcentral and mountain states, in general, encountered the most significant reductions in the number or applications from qualified candidates.

The rate of enrollment acceptances by the colleges declined particularly for the larger colleges and those in the category of public supported institutions, as well as the schools located in the South and the Mountain states.

Results of Survey by Characteristics of Institutions

Analysis of the response to each question are tabulated in the appendix and discussed in the following paragraphs.

1. Was the number of qualified applicants for admission to the freshman engineering class in the Fall of 1958 higher or lower than in the Fall of 1957? If lower, what were the contributory factors, in order of importance? (Examples provided See Table IA and IB for details).

In 1958 about two-thirds of all institutions reported a decline in the number of applications received from qualified candidates for enrollment as engineering freshman. In 1959 the proportion was smaller, indicating a general increase in qualified applicants.

Public institutions reported a further drop in qualified applicants, while private colleges encountered improvement. Geographically, the principal change occurred in the Mountain area - where 83% reported a lower number of qualified applicants compared with 38% only in 1958. Schools in the Midwest and East on the otherhand, experienced improvement.

From an overall point of view, the problem was less acute than in 1958. The suggested contributory causes for the decline were, in order of ranking:

(1) Increased interest in other scientific fields. The trend of hightened interest in "science"noted last year is considered by the majority of Deans to be the primary factor in the decline of numbers of applicants. In the 1958 study, this was considered the third most important factor.

(2) Concern about the rigors of engineering curriculum. This factor was again selected as second in affecting applications to engineering colleges. The Deans consider that there is an increased tendency on the part of students to avoid courses that are considered difficult with which engineering is closely identified. Many Deans urge that realistic appraisals of the nature and purposes of engineering education be made to high school students in their early stages of academic preparation for college.

(3) Decrease in applications from those without genuine interest and motivation for engineering. More importance is attached this year to this cause than last year. The indication is that students that have not had strong inclinations toward engineering are currently less likely to apply to engineering colleges than in previous years. If this trend should help to arrest the increasing mortality in upper classes it will certainly be welcomed by the engineering colleges and their faculties. Other factors checked by Deans included: (a) Reports of diminishing opportunities in engineering, presumably a lingering fear from the newspaper inspired stories of the 1957-58 recession concerning employment difficulties in engineering. This concern was identified as the most important single factor in 1958, (b) Decreased ability to finance an engineering education and (c) Higher tuition. With some exceptions, these factors were not considered of vital significance this year.

II. <u>Did you accept for 1959 Fall enrollment as many applicants as you did in 1958? If no what were the contributory causes? (See Table II for tabulation of responses).</u>

Approximately one half of all colleges accepted as many candidates as they did in 1958. The trend for the past two years has been toward a decreasing number of acceptances. As might be expected - from the share of the enrollment decline - a higher proportion of the larger institutions as well as of public the colleges were forced to accept a smaller number of applicants. There were also some regional variations particularly in the Southcentral and Mountain states where there was a considerable drop in the number of qualified applicants.

With a more overwelming vote than recorded in 1958, the principal reason for the drop in acceptances was identified as a steady decline in the number of qualified candidates applying for enrollment. Application of higher standards was mentioned as a secondary factor, but only by a relative small number of colleges. It appears that use of higher entrance requirements - mentioned with some frequency in 1958 - was not widespread and in view of declining rolls of applicants, many colleges have not wished to cause further drops in the undergraduate classes by this method.

III. Compared with the 1958 experience, did as high a preportion of applicants accepted for the 1959 Fall freshman enrollment actually enroll? If no, do you believe this was due to an increase in multiple applications? Are other factors important? (See Table III for tabulation of replies).

In 1958 the "no show" problem-students accepted for enrollment that do not enroll in the Fall - was considered serious. As many as four out of ten colleges reported a lower proportion of accepted candidates registering in the Fall, compared with the experience of the previous year.

This year, however, the problem has improved markedly with less than 1 out of five schools reporting a worsening in the "no show" problem. Only the larger institutions experienced a marked increase in drop outs prior to registration. Private colleges particularly encountered a complete reversal of the 1958 trend.

Of the small proportion that considered this factor of serious concern, slightly over half believe the reason stems from an increase in multiple applications - one student applying to several institutions and failing to cancel the application before registration time.

In view of the general improvement it would appear that the widely published drop in engineering enrollment in 1958 may have persuaded many potential engineering applicants that there would not be serious dearth of facilities and, therefore, no need for extensive filing of multiple applications.

IV. On the basis of evidence now available (number of applications, etc.) do you expect engineering freshman enrollment in your institution to increase or decrease in the Fall of 1960? Indicate percentage. (See Table IV for details).

The purpose of this question was to secure the views of the Deans on the current indications for future enrollment and was not expected to produce any firm forecast of numbers. It is interesting to note that 45% of the colleges last year anticipated modest increases, 20% expected to remain about the same and 34% expected to register further losses.

The majority of Deans are more optimistic this year, with 83% expecting to retain current enrollment levels or actually increase freshman enrollment in the Fall of 1960. ECPD institutions particularly report much improved conditions over 1958. On the other hand, of the larger institutions - that had significant declines in 1959 - 33% anticipate further declines this year.

In 1958 the private institutions anticipated further declines in 1959. In reality their enrollments improved noticeably and currently they are looking for further improvements in 1960. Regionally, only the Southcentral states may continue to experience losses which they have consistently sustained for the past two years.

It appears that the total national engineering freshman enrollment will show a gain in 1960, although the magnitude of this increment cannot be ascertained at this time.

V. Was there greater attrition during the past year for the present (1959-60) sophomore, junior and senior classes, comparable to that of recent previous years? If so, what were the contributory factors in order of importance? (Examples given see Table V for details).

An inquiry, distinct from consideration of freshman enrollment, was made of the trend in attrition of engineering students in undergraduate classes.

The same proportion (35%) of colleges reported increased attritions in 1958 and again in 1959. The proportion increased for ECPD colleges and public institutions but improved for private institutions. In 1959 there was a wide variation by geographic area, whereas in 1958 location played no significant influence. Retention is reported to have improved in the East and Mountain states and decreased in Midwest and West.

Attrition - nationwide - continues to increase each year and is emerging as a serious problem for an increasing number of engineering colleges. The causes of this trend in the view of the Deans are (in order of importance): (1) Concern about the rigors of engineering curriculum (as reported in 1950); (2) Application of higher scholastic standards (which last year was a weak third and is now actually considered the primary factor by the private colleges); (3) Increased interest in other scientific fields (4) Decreased ability to finance an engineering education.

The significance of this trend is that the proportion of degrees to freshman four years earlier is declining and earlier estimates of the number of engineering degrees that will be awarded in the next few years will have to be revised downward.

APPENDIX A - COMMENTARIES FROM DEANS

We have taken the liberty of quoting various comments received from the Deans which are of interest and may illustrate the breadth and depth of the problem involved:

"We are still unhappy with the rigor and level of the high school training given to our students in Physics, Chemistry, and Mathematics. Perspective engineering and science students are not receiving the type of training in these subjects that are necessary. High school courses especially in this area are watered-down versions of real courses and stress the glamour of the type of "science" that appear in the daily press.-

"Our high school students are not required to put in the effort, either quantitatively or qualitatively, necessary to thoroughly prepare in these subjects. When they reach college, they are completely bowled over by the demands made upon them. This is a major reason for the great attrition in the first year.-

"Another serious trend that is becoming critical is the habit of the high schools to over-grade their students. In all too many high schools, grades of "B" or "A" are meaningless. These grades are not a measure of the best standard of performance or ability and represent a type of academic inflation perpetrated to improve the chances of the acceptance of students by colleges. This trend should be publicized and efforts taken to stop it."

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"In dealing with applicants applying for admission to Engineering courses, I find that those who enter and fail, do so because of lack of depth in subject matter content in Math and Science Courses. In spite of the fact that they have grades in these subjects of 80% or better, they do not seem to be able to grasp college level work. Today it is impossible to judge an engineering candidate by his high school grades because the teachers are not pressing their students. Another factor is that I have seen applicants with good grades come to the college who should be on the honor roll but who, for lack of ability in developing study habits, never get moving. I'd suggest a course for half a semester, in first year of high school, on "How To Study"."

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"We are getting students who do not know how to work and who do not want to work. As a product of the times our students have been spoiled. With most of the adults with whom these students have associated to date having experienced the depression and war years, this generation of adults have vowed that their children would not experience what they experienced. Consequently, we are dealing with a spoiled generation of young people because of this."

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"It is the consensus of the faculty at this institution (not only in engineering) that an increasingly critical problem is the "lack of maturity" on the part of the entering student body. The number of students who lack orientation or motivation towards any area appears to be an increasing percentage of the total. The gap between the demands and anticipated response at the high school level and the university level seems to be widening despite the announced efforts of the many secondary school groups who are attempting to put more teeth into their college preparatory programs."

"Students coming into engineering are not prepared to adjust themselves to the demands imposed by the technical curricula. Therefore, a high attrition for the first two semesters, namely, 46.5%."

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"Believe an educational publicity program should be waged to acquaint secondary school students, counselors and teachers as to what engineering really is, and what the professional engineer does.-

"These are total Freshmen enrollment figures which do not differentiate between engineers or scientists because of the common Freshman course requirements."

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"Whereas our number of freshmen admitted to engineering during the fall quarter was substantially higher than during the previous year, the rate of attrition has increased so markedly that our overall enrollment is on the decline in engineering. We are progressively increasing our entrance requirements and the changes which are to go into effect next summer are such that I anticipate that these will result in a marked decrease in the number of entering freshmen in engineering. This may decrease the attrition rate but the net result will be that the overall engineering enrollment will continue downward and probably at an accelerated pace.-

"It is my opinion that the engineers are moving in the direction of a more scientific program at a rate faster than the traffic will bear. All of the publicity is about the desirability and glamour of science and as a result many of the students of a more scientific bent are simply taking one of the sciences rather than engineering. On the other hand, those students of a more practical bent are beginning to drift away from engineering. I am personally of the opinion that there will be a demand in industry for many years to come for the type of engineering graduate that we have been turning out in recent years. It is perfectly true that the curriculum which we have had in the past did not extend the best students to their utmost; however, I am afraid the present trend will result in driving the best students completely away from engineering and into the pure sciences and driving a considerable portion of the ordinary students away from engineering and into something like management, or business administration. I am probably completely out of step with the published comments on this situation; however, judging from private conversations I have had with a number of people there are quite a few practicing engineers and engineering educators who share my views.".

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"There needs to be a unified approach on the part of engineering societies and engineering schools to the problem of making it clear to prospective students that the present emphasis on scientific education does not preclude the need for engineering education but rather that the two phases are mutually important in the scientific world. Published releases should emphasize the fact that engineers are necessary partners with scientists."

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"The refusal of students to accept the rigors of engineering study requires investigation and relation to the rewards of engineering. As students say to me "It is too tough for what you get out of it"."

"In my opinion the needed shift to science in the engineering program has now created a void in the education for engineers needed for the operation of modern industry. Two stems of engineering are now needed, one oriented toward science, and the other based on a strong foundation of the physical sciences and the engineering sciences but providing great flexability at the senior level in functions. In addition to the science oriented engineers for research, development, design, and education, we need to educate engineers who are capable of operating complicated systems by making decisions and directing technicians and craftsmen."

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"There is a definite feeling among the highest-caliber students that engineers are either being replaced by scientists or relegated to technicians' classifications. Suggest that many of the selling points of a liberal arts education in science properly belong in high school, notably study of languages. If engineers insisted on a proper background in language and social sciences, and thenbuilt on these in the same sequential manner used in physical science, they might feature engineering as a more efficient program of scientific education. Presently, many of its rigors come from trying to handle everything at the college level."

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"It is my belief that E.J.C. or some other organization whould enter the grade schools and high schools in order to encourage more students to study engineering and to point out the important roles that engineers play in National Defense."

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"The reduction of engineering enrollments, I believe, is largely attributable to the failure of the professional engineering groups to make known to the general public the responsibilities and contributions of the engineer. Recent scientific developments have left the layman with no clearcut idea of just how the engineer fits into modern technology. The high school student is constantly bombarded with the importance of mathematics and the natural sciences -- an emphasis which seems to be carried on into college."

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"September 1959 enrollment of engineering freshmen was up slightly over 1958 (when the effects of the recession were felt) and over 1957 (when we experience a 43% tuition increase). We have announced another increase for September 1960 (20%), but we expect that increased demand will result in a freshman class of about the same size. We will, however, begin the September term with vacancies in at least six of our ten engineering departments. We are, in other words, interested in admitting more <u>qualified</u> students in civil, industrial, geological, metallurgical, mining, and petroleum engineering."

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"Technicians (Scientific and Engineering aides) need to be produced in greater numbers. Perhaps 5-year program will increase status and abilities. Combined, these can result in more efficient use of brainpower, and may reduce attrition while making up for current decline in numbers of engineering graduates."

"We find that more than 60% of those who graduate in science or engineering made the choice while they were seniors in high school.-

"We also find that about 80 percent of our students are electing science in 1958 and in 1959 where as only 50 percent of them so elected in 1954. The remainder elected engineering.-

"The switch is attributed to (1) the increased glamour and higher status attached to science in an atomic - missile - space age, leading counselors to urge more students into science and a larger proportion of these students to respond to such urging (2) increased employment and income opportunities in science publicized in employment literature (3) publicity emphasizing the excellence of Caltech's science offerings, and (4) the challenge to the more brilliant student of what he thinks is a more exclusive vocation."

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"We are of the opinion that we probably hit a low last year, and are anticipating a gradual increase in Engineering enrollment in the years ahead.-

"The present program of differentiating between science programs and engineering programs will, we believe, result in more students taking engineering."

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"I am sure that increases and decreases in enrollment can be rationalized with better results than we are getting.-

(1) Government and Industry should avoid giving out instantaneous needs on a year-to-year basis. Reporting this way causes decline and ficticious increases in freshman enrollment.

(2) We need more publicity about the profession and its accomplishments and less about how many bodies are needed.

(3) Everyone knows that last year industry "shook down: and used the so-called depression to shake the tree of engineering personnel. This did have its effect on enrollment.

(4) It is not the number of freshmen we enter; it is the number of seniors we graduate that is important.

(5) The country probably does need more engineers than we are graduating. It needs better educated engineers and both industry and military should use engineers to do engineering work and should use technicians and other personnel for other types of work. We need four trained technicians for each engineer in the United States.

(6) Engineering schools should have rigid requirements for entrance. If we are a professional school, why not act like one. Engineering should require students to make up prerequisites not taken in high school in the universities general college and not fill up engineering sections and classes with unprepared students.

(7) Engineering schools should not teach any subjects to its students which is of high school level."

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"The Technical Institute is absorbing more of the weaker students who formerly were "given a chance" in engineering, only to later drop out because of poor grades. We need to strengthen out testing methods and counseling procedures to guide the student into the area of study in which he has the highest probability for success. I believe we need better prepared engineers and greater numbers of engineering aides."

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"All of our loss occured in the sophomore and junior classes, particularly at the junior level. In my opinion, this is highly significant in an analysis of current trends in engineering education. The changes in engineering curricula will significantly reduce the number of graduates in the future."

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"The thoughtful attention which you are giving to this problem is most encouraging and is in happy contrast to the experience of ten years ago. However, I suspect that the present problem has more complex and obscure sources than was true then. It will be helpful to continue your present publicity in the press about the problem and also to continue - and hopefully in an increasingly organized fashion - efforts to interest high school students in an engineering career. But I believe that until data are suitably gathered and interpreted, and from as wide a series of studies as possible, there can be no completely successful attack on the problem."

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"I would recommend that universities be given more representation on school board advisory groups, in the high school classroom conducting special seminars with gifted students, and at parents' day functions so that parents can discuss the future of their children with college representatives even at the freshman level."

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"We need some method of providing information to high school students concerning the difference between science and engineering and concerning the preparation which is required for real success in each field."

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"It is our impression that the reduced freshman enrollment of the last two years in engineering may in large part be accounted for by the overemphasis on science as compared with engineering which has appeared in the press and has made its way into the public mind in connection with our programs of missile development, nuclear technology, and advances in electronics to cite some examples. Students with a science-mathematics orientation in high school, being unable to differentiate clearly between science and technology, and understanding inadequately the nature of the preparation for both fields, as well as the necessary qualifications, have been led to enroll in liberal arts college, in particular to major in science, or in technological institutes for the same purpose. In the latter institutions many have subsequently changed from a science to an engineering curriculum, but in the liberal arts college, those who do not continue in science, finding it difficult to transfer into engineering colleges at an advanced level are more likely to transfer to a major in the social sciences. There is great need to bring this problem to the attention of high school guidance counselors, science teachers, prospective students, and their parents, as well as for better information than is now ordinarily available on the

differences between science and technology, and the requirements for and the nature of a career in each.-

"In so far as the rigors of the engineering curriculum are concerned, and are a factor in dissuading certain students from matriculating in engineering schools, there appears need for a more forthright presentation of the nature of engineering education than most college catalogues provide."

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"I am inclined to believe that the emphasis on science in connection with publicity about space age endeavors, even though engineering is also heavily involved, tends to make the high school student think of science rather than engineering as a goal. I recognize that more and better educated people are needed in both areas but I feel that in many cases the decision as to which field to study is made without an adequate knowledge of the characteristics of each."

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"Although our estimates for next year - 1960-61 - have been for a raise in the number of students accepted we actually look for about the same number or possibly even a slight decrease because we are raising the tuition again next fall by a total of $120/year. Naturally we hope that this will not have any appreciable effect. This raises the question of student aid and I personally believe the various governments, State and Federal, will have to aid in locating and financing to whatever degree possible and desirable those students who should continue in higher education but who either have the desire but no money, or who should be motivated to continue. Obviously steps are being taken in this direction; they must be expanded.-

"I also believe that the time is not far off when institutions such as ours - a strictly private institution existing on student fees and donations - will have to begin to share in the public support of education; if this is not done the high tuitions necessary will drive more and more students into the tax supported schools. Therefore, tax support of private schools should become an item of critical interest, not support as given to the State schools, but aids to enable a tuition rate that will be acceptable to the prospective students and enable the schools to advance their work in a normal manner without having the faculty subsidize education as is now necessary through lower salaries than are realistic in todays price and inflation situation."

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"This is a national problem, the solution of which must start at the high school level. First - educate the guidance counsellors in the differences between trade school, technical institute, and engineering college. Second - clarify the confusion engendered by this word "science"; the short, simple slogan I suggest is, "Engineering puts science to work." Third - sell the idea that 140 credits for a B. S. in Engineering in 4 years gets the student more for his education dollar than 120 credits for a B. A. Fourth - get more women students into engineering by selling the idea that a girl spending 4 years in college might just as well start on a job paying $6000 per year as to start on one paying $4000. This suggestion I have made in speeches before women's organizations, and judging by audience reaction, it has been well received."

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"In my opinion there were too many engineering freshmen in our colleges in 1957. The decline during the last two years is a decline from an inflated peak. We are now returning to what might be called a normal curve of growth. Having predicted this slump several years ago, I see no cause for undue arlarm!"

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"There is a need for increased scholarship aid for engineering. This aid should be given to the student without specification as to college. Recent Ford Foundation Graduate Fellowships have specified schools where these fellowships are valid. This will make the strong schools stronger and weak schools weaker. A complete solution to increasing engineering graduates is to support all engineering colleges impartially with scholarship aids and the student select his own college."

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APPENDIX B - STATISTICAL TABULATIONS

For purposes of comparison, the results of the 1958 study are presented with the findings of the present study. For a discussion of the tables see the text under the same identification number.

TABLE 1A

See Page 4.

CHANGE IN NUMBER OF QUALIFIED APPLICANTS
(1958 and 1959 compared with previous year)

Classification	Higher Number Qualified Applicants Accepted (By Percentage of Reporting Institutions)		Lower Number Qualified Applicants Accepted (By Percentage of Reporting Institutions)	
	1958	1959	1958	1959
All Institutions	36%	45%	64%	55%
ECPD Institutions	38	50	62	50
By Size - 1-499	37	45	63	55
500-Up	36	46	64	56
By Support - Public	39	35	61	65
Private	34	57	66	43
By Area - East	48	61	52	39
Midwest	23	50	77	50
South	52	48	48	52
Southcentral	6	7	94	93
Mountain	62	17	38	83
Pacific	21	50	79	63

TABLE 1B

See Page 4

CAUSES OF DROP IN APPLICATIONS

Classification	Causes by Rated Order of Importance (First - 1, Second - 2, etc.)											
	A		B		C		D		E		F	
	58	59	58	59	58	59	58	59	58	59	58	59
All Institutions	1	4	3	1	2	2	5	5	6	6	4	3
ECPD Institutions	1	4	2	1	3	3	5	5	6	7	4	2
By Support - Public	1	4	3	2	2	1	5	5	6	6	4	3
Private	5	5	2	1	1	2	4	4	3	6	6	3
By Area - East	1	4	2	1	4	2	6	5	3	6	5	3
Midwest	1	4	2	2	3	1	5	5	6	7	4	3
South	4	5	2	1	1	2	5	4	6	6	3	3
Southcentral	1	3	5	1	2	2	4	6	6	5	3	4
Mountain	2	4	4	1	3	3	1	5	-	-	-	2
Public	4	7	1	3	3	1	5	5	6	6	2	2

A-Reports of diminishing employment opportunities in engineering. B-Increased interest in other scientific fields. C-Concern about the rigors of engineering curriculum. D-Decreased ability to finance an engineering education. E-Higher tuition. F-Decrease in application from those without genuine interest and motivation for engineering. G-Others - (Specify)

TABLE II

See Page 5.

CHANGE IN RATE OF ACCEPTANCES OF APPLICANTS

Classification	Same or Higher (Percentage of Reporting Institutions)		Lower (Percentage of Reporting Institutions)		Reasons* (Order of Importance)			
	1958	1959	1958	1959	J 58	J 59	K 58	K 59
All Institutions	50%	52%	50%	48%	1	1	2	2
ECPD Institutions	50	53	50	47	1	1	2	2
By Size - 1-499	53	60	47	40	1	1	2	2
500 - Up	54	42	46	58	1	1	2	2
By Support - Public	52	43	48	57	1	1	2	2
Private	49	60	51	40	1	1	2	2
By Area - East	59	70	41	30	2	1	1	2
Midwest	44	68	56	32	1	1	2	2
South	65	58	35	42	1	1	2	2
Southcentral	25	--	75	100	2	1	1	2
Mountain	62	18	48	82	2	1	1	2
Pacific	37	45	63	55	2	1	1	2

*Reasons J-Decreased number of applications with same admission standards. K-Use of higher admission standards.

TABLE III

See Page 6.

CHANGES IN ENROLLMENT PROPORTION OF ACCEPTED APPLICANTS
(1958 and 1959 compared with previous year)

Classification	Higher (By Percentage of Reporting Institutions)		Lower (By Percentage of Reporting Institutions)		Caused by Increase In Multiple Applications (By Percentage of Reporting Institutions)	
	1958	1959	1958	1959	1958	1959
All Institutions	61%	82%	39%	18%	57%	55%
ECPD Institutions	55	84	45	16	65	50
By Size - 1-499	64	83	36	17	--	--
500-Up	55	65	45	35	--	--
By Support - Public	61	80	39	20	50	46
Private	60	83	40	17	46	67
By Area - East	56	84	44	16	42	67
Midwest	60	78	40	22	54	50
South	60	78	40	22	84	40
Southcentral	67	84	33	16	50	--
Mountain	69	82	31	18	67	100
Public	74	73	26	17	18	67

TABLE IV

See Page 6

ANTICIPATED TREND FOR FALL 1960 FRESHMAN ENGINEERING ENROLLMENT
(By Percentage of Reporting Institutions)

Classification	INCREASE or SAME				TOTAL	
	0-5%		5% and Up			
	1958	1959	1958	1959	1958	1959
All Institutions	54%	48%	26%	35%	80%	83%
ECPD Institutions	53	48	16	32	69	80
By Size - 1-499	--	--	--	--	79	75
500 - Up	--	--	--	--	80	67
By Support - Public	57	47	29	36	88	83
Private	51	50	20	32	71	82
By Area - East	48	32	20	47	68	80
Midwest	80	55	14	23	94	78
South	48	47	26	29	74	76
Southcentral	43	43	21	14	64	57
Mountain	69	100	16	--	85	100
Pacific	42	55	33	45	75	100

TABLE IV - continued --

Classification	DECREASE				TOTAL	
	0-5%		5% and Up			
	1958	1959	1958	1959	1958	1959
All Institutions	12%	15%	8%	2%	20%	17%
ECPD Institutions	13	18	7	2	21	20
By Size - 1-499	--	--	--	--	21	25
500 - Up	--	--	--	--	20	33
By Support - Public	10	17	2	--	12	17
Private	14	12	15	6	29	18
By Area - East	12	16	20	4	32	20
Midwest	3	22	3	--	6	22
South	17	24	9	--	6	22
Southcentral	36	29	--	14	36	43
Mountain	15	--	--	--	15	--
Pacific	25	--	--	--	25	--

TABLE V

See Page 7

TREND IN ATTRITION OF ENGINEERING SOPHOMORE, JUNIOR AND SENIOR CLASSES
(1958 and 1959 compared with previous years)

Classification	% Institutions Experiencing Greater Attrition		Causes by Rated Order of Importance									
			P		Q		R		S		T	
	1958	1959	58	59	58	59	58	59	58	59	58	59
All Institutions	35%	35%	5	-	3	4	1	1	2	3	4	2
ECPD Institutions	32	34	5	4	4	6	1	1	2	3	3	2
By Support - Public	42	45	5	4	3	6	2	1	4	3	1	2
Private	32	22	5	3	4	5	1	2	2	4	3	1
By Area - East	40	20	-	4	3	6	2	1	4	5	1	2
Midwest	35	45	2	4	5	6	1	1	3	3	4	2
South	37	38	4	4	-	5	2	1	3	2	1	3
Southcentral	39	42	-	4	1	2	2	3	3	5	-	1
Mountain	30	22	1	4	2	-	3	2	4	3	5	1
Pacific	43	67	4	3	3	-	1	2	-	5	2	2

P-Decreased ability to finance an engineering education. Q-Reports of diminishing employment opportunities in engineering. R-Concern about rigors of engineering curriculum. S-Increased interest in other scientific fields. T-Applications of higher scholastic standards.

APPENDIX C - QUESTIONNAIRE

TRENDS IN ENGINEERING ENROLLMENT

Please return by February 8 one completed form to:

Engineering Manpower Commission
29 West 39 Street
New York 18, New York

Institution_____ Dean_____

1. Was the number of qualified applicants for admission to the freshman engineering class in the Fall of 1959 higher or lower than in the Fall of 1958? Higher_____ Lower_____

If lower, please indicate the order of importance of the following factors, or any others, contributing to the decline:

Order of Importance (1,2,3, etc.)	Factors
_____	-Reports of diminishing employment opportunities in engineering.
_____	-Increased interest in other scientific fields.
_____	-Concern about the rigors of engineering curriculum.
_____	-Decreased ability to finance an engineering education.
_____	-Higher tuition.
_____	-Decrease in applications from those without genuine interest and motivation for engineering.
_____	-Others - (Specify)

2. Did you accept for 1959 Fall freshman enrollment as many applicants as you did in 1958? Yes____ No____

If no, please indicate the order of importance of the following factors, or any others contributing to the decline in acceptances:

Order of Importance	Factors
_____	-Decreased number of applications with same admission standards.
_____	-Use of higher admission standards.
_____	-Inadequate staff or facilities.
_____	-Others - (Specify)

3. Compared with the 1958 experience, did as high a proportion of applicants accepted for the 1959 Fall freshman enrollment actually enroll? Yes_____ No_____

If no, do you believe this was due to an increase in multiple applications? Yes_____ No_____

Are any factors listed in Question 1 important? (Specify)

4. On the basis of evidence now available (number of applications, etc.) do you expect engineering freshman enrollments in your institution to increase or decrease in the Fall of 1960?

INcrease_____(Estimated %) DEcrease_____(Estimated %)

5. Was there greater attrition during the past year for the present (1959-60 sophomore, junior and senior classes, comparable to that of recent previous years? Yes_____ No_____

If yes, please indicate the order of importance of the following factors, or any others, contributing to the increase.

Order of Importance	Factors
_____	-Decreased ability to finance an engineering education.
_____	-Reports of diminishing employment opportunities in engineering.
_____	-Concern about rigors of engineering curriculum.
_____	-Increased interest in other scientific fields..
_____	-Applications of higher scholastic standards.
_____	-Others - (Specify)

6. For comparison purposes, kindly indicate the total number of engineering freshman for 1958-59_____and 1959-60_____.

7. Please add below your comments and suggestions for areas of national interest.

1-13-60